## REMARKS

The present invention relates to a process for the deposition of films on substrates by sputtering or magnetron sputtering for the fabrication of multilayer systems.

In the Office Action of December 26, 2007, it is appreciated that the Examiner withdrew the previous objection to Figure 3, and withdrew the previous rejections of claims 1 - 18 under 35 U.S.C. § 102 and 103.

However, in the present Office Action, claims 1 - 2, 6 - 7, 10 - 11, 14, 16, and 18 were rejected under 35 U.S.C. § 112, second paragraph, for indefiniteness, particularly with respect to the term "especially". Claims 1 and 10 were rejected for anticipation under 35 U.S.C. § 102(b) based on U.S. Patent 6,077,403 (Kobayashi). Turning to the obviousness rejections under 35 U.S.C. § 103(a), claims 2 and 11 were rejected based on Kobayashi in view of U.S. Patent 5,942,605 (Pinarbasi); claims 3 - 4, 8 - 9, 12 - 13, 15, and 17 were rejected based on U.S. Patent Publication No. 2003/0024808 (Donohue et al) in view of Pinarbasi; and claim 5 was rejected based on Donohue et al in view of Pinarbasi, further in view of U.S. Patent 5,643,633 (Telford et al). Furthermore, claim 6 was rejected under 35 U.S.C. § 103(a) based on Kobayashi in view of the Vacuum Technology & Coating reference (Gupta et al); claim 7 was rejected based on Kobayashi and Pinarbasi, further in view Gupta et al; and claim 14 was rejected based on Kobayashi in view of Donohue. Still further, claim 16 was rejected based on Kobayashi and Donohue, further in view of Pinarbasi; and lastly, claim 18 was rejected based on Kobayashi in view of U.S. Patent 4,311,725 (Holland).

In response to the Office Action, Applicant has herein amended independent claims 1 and 3 and cancelled certain other claims. As explained below in more detail, it will be seen that the remaining claims pursuant to this Amendment are fully compliant with 35 U.S.C. § 112, and distinguish over and are nonobvious in view of the cited prior art.

Amendments to the claims

Independent claim 1 has been amended by adding the features of original claim 2, viz., that a new thin film is deposited in a first and a subsequent deposition stage, as disclosed, e.g. on page 7, last paragraph, together with page 6, second paragraph of the specification (corresponding to paragraphs [0033] and [0028] of the patent application publication).

Independent claim 3 has been amended by adding the features of original claim 5, viz., that a new thin film is deposited in a first and in a subsequent deposition stage, also being disclosed on page 7, last paragraph in connection with page 6, second paragraph of the specification (corresponding to paragraphs [0033] and [0028] of the patent application publication).

Claims 2, 4, 5, 7, 9, 11, 13, and 18 have been cancelled.

Patentability of amended independent claims 1 and 3

Both of amended independent claims 1 and 3 now recite the feature that a new thin film is deposited in two deposition stages, namely in first deposition stage and in a subsequent deposition stage.

In the first deposition stage, thermalized particles, i.e., particles which have a very low kinetic energy, are used for the deposition. Thermalized particles can be produced either by regulating the working gas pressure and/or the distance between target and substrate so that the mean free path of particles is chosen smaller than the distance between target and substrate, (see claim 1), or by choosing the working gas pressure and the distance between target and substrate to result in a product of pressure and distance being larger than about 2.0 cmPa (see claim 3), see also par. [0028].

In the second deposition stage, the kinetic energy of the particles is higher, so that the mean free path is larger than the distance between target and substrate (see claim 1), or the product of pressure and distance is smaller than about 2.0 cmPa (see claim 3).

As is explained at pages 6 - 7 of the specification (corresponding to par. [0033]) by starting the deposition with thermalized particles, the intermixing with the film of the multilayer system which has been deposited below is efficiently suppressed. After the first deposition stage has been finished, the particles may reach the substrate with most of their initial energy for enabling control of the growing film's roughness, see p. 14, second paragraph of the specification (corresponding to par. [0049]).

As intermixing between layers is efficiently avoided and the roughness of new films can be controlled, multilayer films made by the inventive process as claimed show a higher reflectivity than multilayer systems made by conventional magnetron sputtering with only high energy particles.

State of the art related to amended claim 1

Kobayashi (U.S. Patent 6,077,403) discloses a sputtering process for the deposition of a thin film with a distance between a target and a substrate being about 120 mm, the mean free path of particles being about 5mm or less. Thus, Kobayashi teaches a mean free path of particles being smaller than the distance between target and substrate.

Pinarbasi (U.S. Patent 5,492,605) discloses a sputtering process for the fabrication of multilayered thin film structures. Pinarbasi also states that in sputtering systems, due to the relatively low operating pressures of these systems, generally the mean free path of particles is greater than the distance between the target and the substrate. However, contrary to the statement of the Examiner, Pinarbasi does not teach that a greater mean free path is of advantage. Quite on the contrary, Pinarbasi states that when a greater mean free path is used, backscattered atoms impacting the substrate can have sufficient energy to affect the properties of the growing films by inducing damage and implantation, see column 5, lines 54 to 63.

Since, Pinarbasi thus regards a greater mean free path as a disadvantage, it would not have been obvious for the person skilled in the art to modify Kobayashi by increasing the mean free path of the particles.

Moreover, neither Kobayashi nor Pinarbasi disclose a two-stage process for the deposition of a single thin film, and consequently, both Kobayashi and Pinarbasi fall short of disclosing to change the free path length between the two deposition stages. In that regard,

neither Kobayashi nor Pinarbasi hints at changing the deposition conditions from a lower mean free path to a larger free path during the deposition of a single layer.

State of the art related to amended claim 3

Donohue (U.S. Patent Application Publication 2003/0024808) discloses a method of sputtering a layer from a target using Krypton as the sputtering gas. The product of pressure and distance may be higher than 2.0 cmPa or lower than 2.0 cmPa depending on the operating conditions of the sputtering system.

However, Donohue does not discuss separating the deposition process of a single layer into two deposition stages, and, in particular, does not discuss using a product of pressure and distance being higher than 2.0 cmPa in a first deposition stage and lower than 2.0 cmPa in a subsequent deposition stage.

Although Telford et al (U.S. Patent 5,643,633) teaches using a two-stage process with a first, high-pressure stage followed by a low-pressure stage, combining the teachings of Telford with those of Donohue is not obvious at least for the following reasons:

Telford describes a chemical vapour deposition process, whereas amended claims 1 and 3 relate to sputtering, being a physical vapour deposition process. In particular, for the purpose of depositing tungsten silicide films as taught by Telford, the use of physical vapour deposition processes is not a viable option, since these processes result in films with poor conformal coverage and non-uniform stoichiometry; e.g., see Telford column 1, lines 45 to 49. Therefore,

the skilled person would not have been motivated to combine the teachings of Telford with those of Donohue.

Moreover, due to the different deposition procedure of Telford, the pressure range used is completely different from that of the present application. In particular, the pressures described in Telford are contained in a range from 0.5 Torr to 20 Torr; see, e.g., column 7, lines 41 to 43, i.e. at or above 66.65 Pa. For a pressure of 66.65 Pa, a product of 2.0 cmPa or less may only be attained when the distance between the substrate and the target is 0.3 mm or less, i.e., when the target and the substrate are (almost) in contact with each other. Consequently, the skilled person may only learn from Telford to use two different pressures, both of which will result in a product of distance and pressure well above 2.0 cmPa when a reasonable distance between target and substrate is used.

In summary, none of the documents cited in the Office Action or any combination of these documents provides a scope or content that suggests the present invention as presently claimed.

Dependent Claims

As the remaining claims cited in the Office Action are dependent on either amended claim 1 or amended claim 3, it is respectfully submitted that the rejections raised with respect to the patentability of these claims have also been overcome.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby earnestly solicited.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned attorney at the local Washington, D.C. telephone number listed below.

The U.S.P.T.O. is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

Joseph M. Rüch, Jr.
Registration No. 26,577

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: April 28, 2008